

What is claimed is:

1. A method for automatically locating spots in an image based on intensities of points in the image, comprising:

determining whether a current point in the image and two adjacent points have intensities that are approximately above a minimum threshold intensity; and

identifying whether part of a new spot is located at the current point based only on the intensities of the two adjacent points when the current point has an intensity that is approximately above the minimum threshold intensity.

2. The method of claim 1 wherein said determining comprises determining whether the current point and the two adjacent points have intensities that are approximately within a threshold range comprising the minimum threshold intensity and a maximum threshold intensity.

3. The method of claim 1 wherein said identifying comprises identifying based only on the two adjacent points when the current point is approximately within the threshold range.

4. The method of claim 1 further comprising providing a plurality of pixels that are representative of the points in the image.

5. The method of claim 4 wherein said determining and said identifying comprises using a current pixel that corresponds to the current point and two of the pixels that are adjacent to the current pixel which correspond to the two adjacent points in said determining and said identifying.

6. The method of claim 5 wherein,  
said determining comprises determining whether the current pixel and the two adjacent pixels have intensities that are approximately within a threshold range comprising the minimum threshold intensity and a maximum threshold intensity; and  
said identifying comprises identifying when the current pixel has intensity that is approximately within the threshold range.

7. The method of claim 5 further comprising repeating said determining to evaluate the plurality of pixels by walking through the image pixel-by-pixel in lines of pixels.

8. A method of automatically locating spots in an image based on intensities of pixels in the image, comprising:

determining whether a current pixel in the image and two pixels adjacent to the current pixel have intensities that are approximately within a threshold range;

identifying whether part of a new spot is located at the current pixel based only on the

intensities of the two adjacent pixels when the current pixel has an intensity that is approximately within the threshold range; and

repeating said determining and said identifying to identify a high density array of spots.

9. The method of claim 8 wherein said identifying comprises identifying the current pixel to be part of a known spot when the two adjacent pixels have been identified to be part of that known spot.

10. The method of claim 8 wherein said identifying comprises identifying the current pixel to be part of a known spot when one of the two adjacent pixels has been identified to be part of the known spot and the intensity of the other one of the two adjacent pixels has been determined to be approximately outside the threshold range.

11. The method of claim 8 further comprising determining which ones of the other pixels are part of the new spot.

12. The method of claim 11 comprising determining whether any of the pixels that are determined to be part of the new spot are located at the edge of the image; and

rejecting the new spot in response to determining that the pixels in the new spot are located approximately at the edge of the image.

13. The method of claim 11 further comprising determining that a particular pixel in the image is part of the new spot based on that particular pixel being substantially enclosed by some of the pixels that have been determined to be part of the new spot.

14. The method of claim 8 further comprising identifying where another spot is located in the image based on determining an integrated intensity for a region that is centered on another one of the pixels.

15. A method for automatically locating spots in an image based on intensities of pixels in the image, comprising:

searching for a first pixel that has an intensity that is approximately above a threshold intensity;

determining that a part of a new spot is located at the first pixel in response to said searching;

searching only nearest neighbors recursively starting from the first pixel to identify which ones of the pixels in the image are part of the new spot based on the threshold intensity; and

repeating said searching for a first pixel, said determining, and said searching to identify a high density array of spots in the image.

16. The method of claim 15 wherein said searching recursively comprises searching only nearest

neighbors recursively starting from every pixel that is identified to be part of the new spot to identify which other ones of the pixels in the image are part of that new spot.

17. The method of claim 15 wherein said searching for the first pixel comprises searching serially pixel-by-pixel in lines of pixels.

18. The method of claim 15 wherein said searching recursively comprises searching recursively until substantially all of the pixels that are contiguous with the first pixel and that have intensities that are approximately above the threshold intensity are identified.

19. The method of claim 18 further comprising repeating said searching for a first pixel to locate another spot in response to identifying substantially all of the pixels that are part of the new spot.

20. A method for automatically locating spots in an image based on intensities of pixels in the image, comprising:

searching serially for a first pixel that has an intensity that is approximately above a threshold intensity;

determining that part of a new spot is located at the first pixel in response to said searching; and

searching only nearest neighbors recursively starting from the first pixel to identify which ones of the pixels in the image are part of the new spot based on the threshold intensity.

21. The method of claim 20 wherein said searching serially and said searching only nearest neighbors includes searching each pixel in the image at most once.

22. The method of claim 20 further comprising determining whether one of the pixels that are identified to be part of the new spot are located approximately at an edge of the image.

23. The method of claim 20 further comprising determining that a particular pixel is part of the new spot based on that particular pixel being substantially enclosed by some of the pixels that are identified to be part of the new spot.

24. The method of claim 20 further comprising determining where another spot is located based on determining an integrated intensity for a region in the image that is centered on another one of the pixels.

25. A method for automatically locating spots in an image based on intensities of pixels in the image, comprising:

determining an integrated intensity for each of a plurality of particularly-shaped regions that are each centered on a different one of a plurality of pixels in the image; and

identifying that a new spot is located in one of the regions based on the integrated intensity of that region in relation to the integrated intensities of the other regions.

26. The method of claim 25 wherein said determining comprises providing each of the regions to be approximately the size of a spot pitch for a plurality of spots that are in the image.

27. The method of claim 25 wherein said determining comprises masking each region before determining the integrated intensity.

28. The method of claim 27 wherein said masking comprises masking to sharpen spot characteristics.

29. The method of claim 25 wherein said determining comprises determining which one of the regions has a highest integrated intensity in relation to the rest of the regions to identify which one of the regions includes a new spot.

30. A method for automatically locating spots in an image based on intensities of pixels in the image, comprising:

determining an integrated intensity for a plurality of particularly-shaped regions that are each centered on a different one of a plurality of pixels in the image;

determining which one of the regions has a highest integrated intensity in relation to the rest of the regions to identify which one of the regions includes a new spot; and

setting any of the regions that overlap the region having the highest integrated intensity to have a lowest integrated intensity.

31. The method of claim 30 further comprising determining that a second spot is located in a next region having the next highest integrated intensity in relation to the other regions.

32. The method of claim 30 further comprising determining a center point for the new spot based on a threshold intensity that is determined from the intensities of the pixels in the region in which the new spot was identified to be located.

33. The method of claim 30 wherein said determining which one comprises identifying that one of the regions includes the new spot based on characteristics of pixels that are in that region that are determined based on a threshold intensity.



34. The method of claim 30 further comprising determining a location for another spot based on a threshold intensity.

35. A method for relating a plurality of spots that have been placed on a slide to a grid comprising grid points that were used in placing the spots on the slide, comprising:

providing an image that is representative of the slide;

determining where the spots are located in the image;

mapping the grid on to the image using a plurality of test locations on the image as origins for the grid to determine a best origin for the grid in relation to the spots; and

assigning each spot to one of the grid points in the grid based on evaluating which grid point is nearest to the location of that spot.

36. The method of claim 35 wherein said providing comprises generating the image using a plurality of pixels that are each representative of approximately one of a plurality of points on the slide based on an intensity of the point that each pixel represents.

37. The method of claim 36 wherein said mapping comprises selecting one of the test locations to be the best origin based on a total intensity for

pixels that are approximately within a selected distance from each grid point.

38. The method of claim 36 further comprising selecting one of the test locations to be the best origin based on a total distance between every one of the grid points and the spot nearest to that grid point.

39. The method of claim 35 further comprising determining a positional relationship of the grid points to each other based a spot pitch, pin pitch, number of rows and columns of spots, and number of rows and columns of printer pins of a spot printer that was used to place the spots on the slide.

40. The method of claim 35 further comprising determining an actual spot pitch based on where spots are located in the image.

41. The method of claim 40 wherein said mapping further comprises adjusting the shape of the grid based on the actual spot pitch.

42. The method of claim 40 wherein said determining an actual spot pitch comprises determining a directional spot pitch vector by averaging vectors for pairs of nearest neighboring spots in approximately one direction.

43. The method of claim 40 wherein said determining an actual spot pitch comprises:

    sorting the spots based on where they are located in the image;

    selecting a plurality of pairs of spots based on the sorted list; and

    determining a spot pitch vector by averaging vectors for the selected pairs of spots.

44. A method for using intensities of pixels in a current image having a plurality of spots to filter further images comprising:

    identifying in a current image a plurality of similarly-shaped regions that each include one of the spots that each include a plurality of pixels; and

    determining an average intensity profile for the regions based on averaging intensities for the pixels that are approximately in the same location in each of the identified regions; and

    filtering intensities in further images using the average intensity profile.

45. The method of claim 44 wherein said identifying comprises centering each of the regions over the spot that is in that region.

46. The method of claim 44 wherein said filtering comprises filtering using the average intensity profile to weigh pixels in further images that are to be analyzed.

47. The method of claim 44 further comprising identifying spot locations in the further images based on the filtered intensities.

48. A method for analyzing a plurality of spots that are placed on a slide to test expressions of a plurality of source materials in the spots based on a plurality of images that are each differently representative of the slide, wherein locations of the spots in the images have been determined, comprising:

determining an aligned image for each of a plurality of the images based on the locations of spots in one of the plurality of images in relation to the location of spots in each of the other images;

determining a composite image based on the aligned images;

determining which areas in the composite image comprises spots; and

analyzing areas in one of the aligned images for expressions of one of the source materials based on the areas that were determined to comprise spots in the composite image.

49. The method of claim 48 further comprising:

providing for each of the plurality of the images a plurality of pixels that are each representative of a point on the slide being represented by that image; and

wherein said determining an aligned image, comprises aligning the pixels to form the aligned image for each slide.

50. The method of claim 49 wherein said aligning comprises applying a matrix transform on a pixel-by-pixel basis to determine the aligned image for each slide.

51. The method of claim 49 wherein said determining an aligned image comprises:

selecting one of the images to be a reference image; and

aligning the other images to the selected reference image.

52. The method of claim 49 wherein said providing comprises:

providing each of the plurality of pixels to have an intensity of the point which that pixel represents; and

said determining a composite image, comprises combining light intensities for pixels that are approximately in a same location in each of the aligned images.

53. The method of claim 49 wherein said determining which areas, comprises determining which areas based on a threshold intensity for the pixels in the composite image.

54. The method of claim 49 wherein said determining which areas, comprises determining which areas based on an integrated intensity for each of a plurality of regions in the composite image.

55. A method for automatically determining where spots in an image are located based on intensities of a plurality of pixels in the image, comprising:

determining a threshold intensity for a particular image region based on intensities of a portion of the pixels in that region; and

determining whether one of the spots is at least partly located in the region based on the threshold intensity determined for that region.

56. The method of claim 55 wherein said determining a threshold intensity, comprises using the portion to be approximately a size of an average spot.

57. The method of claim 55 further comprising repeating for another region said determining a threshold intensity and said determining whether one of the spots to determine whether there are any spots in the other region.

58. The method of claim 57 wherein said repeating comprises selecting the other region based on a spot pitch for the spots in the slide and a current region.

59. The method of claim 55 wherein said determining whether one of the spots, comprises determining whether one of the spots is at least partly in the region based on characteristics of a group of the pixels in the particular region.

60. The method of claim 55 further comprising:

determining that one of the spots is at least partly in the region;

determining which ones of the pixels in that region are part of the spot that is at least partly in that region;

determining a center pixel for the pixels that have been determined to be in that spot; and

moving the region to be centered on the center pixel and repeating said determining threshold intensity and said determining whether one of the spots.

61. A method for automatically locating spots in an image based on intensities of pixels in the image comprising:

determining an integrated intensity for each of a plurality of regions in the image;

sorting the integrated intensities in the regions in descending order; and

claiming some of the regions to contain spots based on determining the highest integrated intensity among the regions while setting the

integrated intensities for the regions that overlap the claimed regions to be a lowest integrated intensity.

62. The method of claim 61 wherein said claiming comprises setting overlapping regions to zero.

63. The method of claim 61 wherein said determining comprises masking the regions when determining the integrating intensity in each one of the regions.

64. The method of claim 61 further comprising providing the regions to be approximately the size of a spot pitch for the spots in the image.

65. A machine-readable storage medium encoded with a set of machine executable instructions for using image analysis equipment to perform a method for automatically locating spots in an image based on intensities of points in the image, comprising:

determining whether a current point in the image and two adjacent points have intensities that are approximately above a minimum threshold intensity; and

identifying whether part of a new spot is located at the current point based only on the intensities of the two adjacent points when the current point has an intensity that is approximately above the minimum threshold intensity.



66. The machine-readable storage medium of claim 65 wherein said determining in said method comprises determining whether the current point and the two adjacent points have intensities that are approximately within a threshold range comprising the minimum threshold intensity and a maximum threshold intensity.

67. The machine-readable storage medium of claim 65 wherein said identifying in said method comprises identifying based only on the two adjacent points when the current point is approximately within the threshold range.

68. The machine-readable storage medium of claim 65 wherein said method further comprising providing a plurality of pixels that are representative of the points in the image.

69. The machine-readable storage medium of claim 68 wherein said determining and said identifying in said method comprises using a current pixel that corresponds to the current point and two of the pixels that are adjacent to the current pixel which correspond to the two adjacent points in said determining and said identifying.

70. The machine-readable storage medium of claim 69 wherein,  
said determining in said method  
comprises determining whether the current pixel and the

two adjacent pixels have intensities that are approximately within a threshold range comprising the minimum threshold intensity and a maximum threshold intensity; and

said identifying in said method comprises identifying when the current pixel has intensity that is approximately within the threshold range.

71. The machine-readable storage medium of claim 69 wherein said method further comprising repeating said determining to evaluate the plurality of pixels by walking through the image pixel-by-pixel in lines of pixels.

72. A machine-readable storage medium encoded with a set of machine executable instructions for using image analysis equipment to perform a method of automatically locating spots in an image based on intensities of pixels in the image, comprising:

determining whether a current pixel in the image and two pixels adjacent to the current pixel have intensities that are approximately within a threshold range;

identifying whether part of a new spot that is located at the current pixel based only on the intensities of the two adjacent pixels when the current pixel has an intensity that is approximately within the threshold range; and

repeating said determining and said identifying to identify a high density array of spots.

73. The machine-readable storage medium of claim 72 wherein said identifying in said method comprises identifying the current pixel to be part of a known spot when the two adjacent pixels have been identified to be part of that known spot.

74. The machine-readable storage medium of claim 72 wherein said identifying in said method comprises identifying the current pixel to be part of a known spot when one of the two adjacent pixels has been identified to be part of the known spot and the intensity of the other one of the two adjacent pixels has been determined to be approximately outside the threshold range.

75. The machine-readable storage medium of claim 74 wherein said method further comprising determining which ones of the other pixels are part of the new spot.

76. The machine-readable storage medium of claim 75 wherein said method comprising:

determining whether any of the pixels that are determined to be part of the new spot are located at the edge of the image; and

rejecting the new spot in response to determining that the pixels in the new spot are located approximately at the edge of the image.

77. The machine-readable storage medium of claim 75 wherein said method further comprising

determining that a particular pixel in the image is part of the new spot based on that particular pixel being substantially enclosed by some of the pixels that have been determined to be part of the new spot.

78. The machine-readable storage medium of claim 72 wherein said method further comprising identifying where another spot is located in the image based on determining an integrated intensity for a region that is centered on another one of the pixels.

79. A machine-readable storage medium encoded with a set of machine executable instructions for using image analysis equipment to perform a method for automatically locating spots in an image based on intensities of pixels in the image, comprising:

searching for a first pixel that has an intensity that is approximately above a threshold intensity;

determining that a part of a new spot is located at the first pixel in response to said searching;

searching only nearest neighbors recursively starting from the first pixel to identify which ones of the pixels in the image are part of the new spot based on the threshold intensity; and

repeating said searching for a first pixel, said determining, and said searching to identify a high density array of spots in the image.

80. The machine-readable storage medium of claim 79 wherein said searching only nearest neighbors recursively comprises searching recursively starting from every pixel that is identified to be part of the new spot to identify which ones of the pixels in the image are part of that new spot.

81. The machine-readable storage medium of claim 79 wherein said searching for the first pixel comprises searching serially pixel-by-pixel in lines of pixels.

82. The machine-readable storage medium of claim 79 wherein said searching recursively comprises searching recursively until substantially all of the pixels that are contiguous with the first pixel and that have intensities that are approximately above the threshold intensity are identified.

83. The machine-readable storage medium of claim 82 wherein said method further comprising repeating said searching for a first pixel to locate another spot in response to identifying substantially all of the pixels that are part of the new spot.

84. A machine-readable storage medium encoded with a set of machine executable instructions for using image analysis equipment to perform a method for automatically locating spots in an image based on intensities of pixels in the image, comprising:

searching serially for a first pixel that has an intensity that is approximately above a threshold intensity;

determining that part of a new spot is located at the first pixel in response to said searching; and

searching only nearest neighbors recursively starting from the first pixel to identify which ones of the pixels in the image are part of the new spot based on the threshold intensity.

85. The machine-readable storage medium of claim 84 wherein said searching serially and said searching only nearest neighbors includes searching each pixel in the image at most once.

86. The machine-readable storage medium of claim 84 wherein said method further comprising determining whether one of the pixels that are identified to be part of the new spot are located approximately at an edge of the image.

87. The machine-readable storage medium of claim 84 wherein said method further comprising determining that a particular pixel is part of the new spot based on that particular pixel being substantially enclosed by some of the pixels that are identified to be part of the new spot.

88. The machine-readable storage medium of claim 84 wherein said method further comprising

determining where another spot is located based on determining an integrated intensity for a region in the image that is centered on another one of the pixels.

89. A machine-readable storage medium encoded with a set of machine executable instructions for using image analysis equipment to perform a method for automatically locating spots in an image based on intensities of pixels in the image, comprising:

determining an integrated intensity for each of a plurality of particularly-shaped regions that are each centered on one of a plurality of pixels in the image; and

identifying that a new spot is located in one of the regions based on the integrated intensity of that region in relation to the integrated intensities of the other regions.

90. The machine-readable storage medium of claim 89 wherein said determining comprises providing each of the regions to be approximately the size of a spot pitch for a plurality of spots that are in the image.

91. The machine-readable storage medium of claim 89 wherein said determining comprises masking each region before determining the integrated intensity.

92. The machine-readable storage medium of claim 91 wherein said masking comprises masking to sharpen spot characteristics.

93. The machine-readable storage medium of claim 89 wherein said determining comprises determining which one of the regions has a highest integrated intensity in relation to the rest of the regions to identify which one of the regions includes a new spot.

94. A machine-readable storage medium encoded with a set of machine executable instructions for using image analysis equipment to perform a method for automatically locating spots in an image based on intensities of pixels in the image, comprising:

determining an integrated intensity for a plurality of particularly-shaped regions that are each centered on one of a plurality of pixels in the image;

determining which one of the regions has a highest integrated intensity in relation to the rest of the regions to identify which one of the regions includes a new spot; and

setting any of the regions that overlap the region having the highest integrated intensity to have a lowest integrated intensity.

95. The machine-readable storage medium of claim 94 wherein said method further comprising determining that a second spot is located in a next



region having the next highest integrated intensity in relation to the other regions.

96. The machine-readable storage medium of claim 94 wherein said method further comprising determining a center point for the new spot based on a threshold intensity that is determined from the intensities of the pixels in the region in which the new spot was identified to be located.

97. The machine-readable storage medium of claim 94 wherein said determining which one comprises identifying that one of the regions includes the new spot based on characteristics of pixels that are in that region that are determined based on a threshold intensity.

98. The machine-readable storage medium of claim 94 wherein said method further comprising determining a location for another spot based on a threshold intensity.

99. A machine-readable storage medium encoded with a set of machine executable instructions for using image analysis equipment to perform a method for relating a plurality of spots that have been placed on a slide to a grid comprising grid points that were used in placing the spots on the slide, comprising:

providing an image that is representative of the slide;

determining where the spots are located in the image;

mapping the grid on to the image using a plurality of test locations on the image as origins for the grid to determine a best origin for the grid in relation to the spots; and

assigning each spot to one of the grid points in the grid based on evaluating which grid point is nearest to the location of that spot.

100. The machine-readable storage medium of claim 99 wherein said providing comprises generating the image using a plurality of pixels that are each representative of approximately one of a plurality of points on the slide based on an intensity of the point that each pixel represents.

101. The machine-readable storage medium of claim 100 wherein said mapping comprises selecting one of the test locations to be the best origin based on a total intensity for pixels that are approximately within a selected distance from each grid point.

102. The machine-readable storage medium of claim 100 wherein said method further comprising selecting one of the test locations to be the best origin based on a total distance between every one of the grid points and the spot nearest to that grid point.

103. The machine-readable storage medium of claim 99 wherein said method further comprising determining a positional relationship of the grid points to each other based a spot pitch, pin pitch, number of rows and columns of spots, and number of rows and columns of printer pins of a spot printer that was used to place the spots on the slide.

104. The machine-readable storage medium of claim 99 wherein said method further comprising determining an actual spot pitch based on where spots are located in the image.

105. The machine-readable storage medium of claim 104 wherein said mapping further comprises adjusting the shape of the grid based on the actual spot pitch.

106. The machine-readable storage medium of claim 104 wherein said determining an actual spot pitch comprises determining a directional spot pitch vector by averaging vectors for pairs of nearest neighboring spots in approximately one direction.

107. The machine-readable storage medium of claim 104 wherein said determining an actual spot pitch comprises:

    sorting the spots based on where they are located in the image;

    selecting a plurality of pairs of spots based on the sorted list; and

determining a spot pitch vector by averaging vectors for the selected pairs of spots.

108. A machine-readable storage medium encoded with a set of machine executable instructions for using image analysis equipment to perform a method for using intensities of pixels in a current image having a plurality of spots to filter further images comprising:

identifying in a current image a plurality of similarly-shaped regions that each include one of the spots that each include a plurality of pixels; and

determining an average intensity profile for the regions based on averaging intensities for the pixels that are approximately in the same location in each of the identified regions; and

filtering intensities in further images using the average intensity profile.

109. The machine-readable storage medium of claim 108 wherein said identifying comprises centering each of the regions over the spot that is in that region.

110. The machine-readable storage medium of claim 108 wherein said filtering comprises filtering using the average intensity profile to weigh pixels in further images that are to be analyzed.

111. The machine-readable storage medium of claim 108 further comprising identifying spot locations in the further images based on the filtered intensities.

112. A machine-readable storage medium encoded with a set of machine executable instructions for using image analysis equipment to perform a method for analyzing a plurality of spots that are placed on a slide to test expressions of a plurality of source materials in the spots based on a plurality of images that are each differently representative of the slide, wherein locations of the spots in the images have been determined, comprising:

- determining an aligned image for each of a plurality of the images based on the locations of spots in one of the plurality of images in relation to the location of spots in each of the other images;

- determining a composite image based on the aligned images;

- determining which areas in the composite image comprises spots; and

- analyzing areas in one of the aligned images for expressions of one of the source materials based on the areas that were determined to comprise spots in the composite image.

113. The machine-readable storage medium of claim 112 wherein said method further comprising:

- providing for each of the plurality of the images a plurality of pixels that are each

representative of a point on the slide being represented by that image; and

wherein said determining an aligned image, comprises aligning the pixels to form the aligned image for each slide.

114. The machine-readable storage medium of claim 113 wherein said aligning comprises applying a matrix transform on a pixel-by-pixel basis to determine the aligned image for each slide.

115. The machine-readable storage medium of claim 113 wherein said determining an aligned image comprises:

selecting one of the images to be a reference image; and

aligning the other images to the selected reference image.

116. The machine-readable storage medium of claim 113 wherein said providing comprises:

providing each of the plurality of pixels to have an intensity of the point which that pixel represents; and

said determining a composite image, comprises combining light intensities for pixels that are approximately in a same location in each of the aligned images.

117. The machine-readable storage medium of claim 113 wherein said determining which areas,

comprises determining which areas based on a threshold intensity for the pixels in the composite image.

118. The machine-readable storage medium of claim 113 wherein said determining which areas, comprises determining which areas based on an integrated intensity for each of a plurality of regions in the composite image.

119. A machine-readable storage medium encoded with a set of machine executable instructions for using image analysis equipment to perform a method for automatically determining where spots in an image are located based on intensities of a plurality of pixels in the image, comprising:

determining a threshold intensity for a particular image region based on intensities of a portion of the pixels in that region; and

determining whether one of the spots is at least partly located in the region based on the threshold intensity determined for that region.

120. The machine-readable storage medium of claim 119 wherein said determining a threshold intensity, comprises using the portion to be approximately a size of an average spot.

121. The machine-readable storage medium of claim 119 wherein said method further comprising repeating for another region said determining a threshold intensity and said determining whether one of

the spots to determine whether there are any spots in the other region.

122. The machine-readable storage medium of claim 121 wherein said repeating comprises selecting the other region based on a spot pitch for the spots in the slide and a current region.

123. The machine-readable storage medium of claim 119 wherein said determining whether one of the spots, comprises determining whether one of the spots is at least partly in the region based on characteristics of a group of the pixels in the particular region.

124. The machine-readable storage medium of claim 119 wherein said method further comprising:

determining that one of the spots is at least partly in the region;

determining which ones of the pixels in that region are part of the spot that is at least partly in that region;

determining a center pixel for the pixels that have been determined to be in that spot; and

moving the region to be centered on the center pixel and repeating said determining threshold intensity and said determining whether one of the spots.



125. A machine-readable storage medium encoded with a set of machine executable instructions for using image analysis equipment to perform a method for automatically locating spots in an image based on intensities of pixels in the image comprising:

determining an integrated intensity for each of a plurality of regions in the image;

sorting the integrated intensities in the regions in descending order; and

claiming some of the regions to contain spots based on determining the highest integrated intensity among the regions while setting the integrated intensities for the regions that overlap the claimed regions to be a lowest integrated intensity.

126. The machine-readable storage medium of claim 125 wherein said claiming comprises setting overlapping regions to zero.

127. The machine-readable storage medium of claim 125 wherein said determining comprises masking the regions when determining the integrating intensity in each one of the regions.

128. The machine-readable storage medium of claim 125 wherein said method further comprising providing the regions to be approximately the size of a spot pitch for the spots in the image.

129. A method of automatically locating objects in an image based on intensities of pixels in the image, comprising:

determining whether a current pixel in the image and two pixels adjacent to the current pixel have intensities that are approximately within a threshold range; and

identifying whether part of a new object is located at the current pixel based only on the intensities of the two adjacent pixels when the current pixel has an intensity that is approximately within the threshold range.

130. A method for automatically locating objects in an image based on intensities of pixels in the image, comprising:

searching for a first pixel that has an intensity that is approximately above a threshold intensity;

determining that a part of a new object is located at the first pixel in response to said searching; and

searching only nearest neighbors recursively starting from the first pixel to identify which ones of the pixels in the image are part of the new object based on the threshold intensity.

131. A method for automatically locating objects in an image based on intensities of pixels in the image, comprising:

determining an integrated intensity for each of a plurality of particularly-shaped regions that are each centered on a different one of a plurality of pixels in the image; and

identifying that a new object is located in one of the regions based on the integrated intensity of that region in relation to the integrated intensities of the other regions.

132. A method for automatically locating spots in an image based on intensities of pixels in the image, comprising:

determining an integrated intensity for each of a plurality of particularly-shaped regions that are each centered on a different one of a plurality of pixels in the image;

identifying that a new spot is located in one of the regions based on the integrated intensity of that region in relation to the integrated intensities of the other regions; and

repeating said determining and said identifying to identify a high density array of spots in that image.